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Biosorption of lead (II) ions by pretreated biomass of *Phanerochaete chrysosporium*

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Abstract

Heavy metals are discharged from various industries such as electroplating, metal finishing, textile, storage batteries, mining ceramic and glass. As they pose serious environmental problems and are dangerous for human health, considerable attention has been given for the methods for their removal from the industrial wastewaters. At present, many technologies, such as sulfuration method, electrolysis, membrane and ion-exchange process, can be used for the treatment of wastewater polluted by the heavy metals. However, these methods are less effective and more expensive when heavy metal concentration in the wastewater is low, and some of them are easy to cause the secondary pollution. Removal of heavy metals by biosorption has many advantages, such as fast adsorption speed, removing heavy metal ions selectively under low concentration, high adsorption efficiency, wide range of pH and temperature, less investment and running cost. In addition, some heavy metals can be recovered.

Phanerochaete chrysosporium is a well-known white--rot fungus and it has a strong ability to degrade various xenobiotics and exist in bleaching effluents from pulp and paper mills. It could also be used to remove heavy metals from the wastewaters by adsorbing the metals on its mycelium. The treatment of native biomass improves its biosorption capacity, changes the possible binding groups. In this study the biosorption of heavy metals from aqueous solution on non-living mycelial pellets of *Phanerochaete chrysosporium* treated with caustic, heat and ethanol was studied using batch technique with respect to initial pH value, initial concentration and biomass dosage. *Phanerochaete chrysosporium* was grown in a liquid medium containing mineral and vitamin materials with a complex composition. The maximal adsorption capacity for lead removal was determined at pH 6. The kinetics of lead(II) removal and the relevance of adsorption isotherms for characterization of the uptake were examined. The biosorption process followed pseudo-second order kinetics. The adsorption data of heavy metals on the blank beads and treated biomass could be well described with Freundlich and Langmuir isotherm equation as well. The biomass of *P. chrysosporium* treated with ethanol revealed that it was mechanically stable and had increased adsorption capacity compared to caustic, heat and untreated cells.

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